NAVY TACTICAL DATA INFORMATION DISPLAY COMPLEXITY EFFECTS ON VISUAL SEARCH REACTION TIME AND RESPONSE ACCURACY

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THESIS

Navy Tactical Data Information Display Complexity Effects on Visual Search Reaction Time and Response Accuracy

by

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Navy Tactical Data Information Display
Complexity Effects on Visual Search
Reaction Time and Response Accuracy

by

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Submitted in partial fulfillment of the
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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I. INTRODUCTION

A. GENERAL

The interblend of system designer and engineer with human engineering has gained considerable momentum during the past two decades (McCormick, 1976). The relatively recent awareness of the necessity to match human capacities and limitations with engineering feats is obvious through a statement such as, "The products generated by the engineering process affect human welfare in many ways. People may benefit directly from the product. They may be the users, operators, or maintainers of the product. The human engineer plays a particularly important role in product and system design because he influences the selection among design alternatives as they relate to people." (Kidd and VanCott, 1972)

Thus, to do the task of human factors engineering requires that the role of potential system users be represented in regard to comfort, safety, operation and maintainability. In addition, the human factors engineer must evaluate the operator as an integral system component and become intimately aware of his contribution to the total system. In effect, human factors engineering, "can be considered as the process of designing for human use." (McCormick, 1976)

Particularly in a world of ever increasing technological demands, man is busily producing or improving machine

functions to extend his own capabilities. Machines are presently performing functions which were heretofore only imagined. Paradoxically, however, the limitation of any machine is dependent upon the interface of the operator with his equipment. It is, therefore, little wonder that careful consideration of the man-machine relationship has become imperative.

While investigating the homogenization of man and technology it is necessary to understand the total behavior of the operator utilizing the equipment (VanCott and Chapanis, 1972). For example, if the retention and recall of a series of letters or characters is required in a task then surely some insight by the human factors analyst into memory and temporal decay would be needed. Likewise, a knowledge of eye movement and visual search is required when performing research concerning visual displays. In addition, the human factors specialist must as well analyze the environment under which the operator is subjected. Considerations might entail such factors as speed of equipment operation, simultaneous tasks performed by the worker and the extraneous demands in the human behavior and equipment arena.

In any system design or change it is not only necessary that the human factors specialist consider human welfare, but must as well have an assurance that the system under investigation is functionally effective. To gain this assurance requires an understanding of the mission or objective of the system, knowledge of the overall function of the system and

the link between the system under scrutiny and component systems or subsystems (McCormick, 1976). In traditional systems where the role of man has been previously defined, indepth mission and function analysis may be less emphasized to get to the specific evaluation of the operator's performance of the equipment redesign (Kidd and VanCott, 1972). Therefore, in all cases requiring investigation into a man-machine relationship the first step is a statement of the problem as it relates to human factors considerations.

B. PROBLEM

This thesis addresses but a small segment of man's interface with a complex system: Naval Tactical Data System (NTDS). As a command and control system, NTDS has been a part of the tremendous growth in Navy technology. It has been expressed that, "Probably the most striking development in naval technology since 1945 has been the progressive displacement of weapons by sensors and command/control devices." (Friedman, 1977)

In brief, NTDS is a computer controlled system which collects, processes, displays and reports tactical data to shipboard decision makers. In effect, multiple ships and aircraft can be linked together through radio systems into a single operational unit. Through this real-time data, command personnel can assess the tactical situation quickly and accurately and can employ and reinforce the sensors and weapons of the forces.

NTDS information is displayed automatically on a number of various operator consoles in a ship's Combat Information Center (CIC). The consoles vary in type and style but, for the most part, consist of a planned position indicator radar scope (PPI) and auxiliary information displays. (See Figure 1). Console operators are required to review and scan present information, update tactical data, perform control device entries and communicate with other NTDS operators, supervisors and ships or aircraft. The total system, consoles and auxiliary information displays were designed to extend man's capability in military operations and are constantly undergoing design changes and consideration to improve the ability to meet new demands. In any design change, though, the man-machine interface should be optimized. To do this requires evaluating alternative improvement recommendations by means of controlled experiments to extract measurements of relative value.

The essence of this thesis is to study, through a controlled experiment and from a human factors engineering standpoint, a proposed NTDS auxiliary cathode ray display readout (ACRO). The experiment entails a simulated operational evolution involving operator's search, accuracy and short term memory tasks.

C. TIME SHARING AND OPERATIONAL SIMULATION

In real world situations it is a rare set of circumstances when an operator in a man-machine system can isolate his attention apart from other on-going tasks (Norman, 1969).

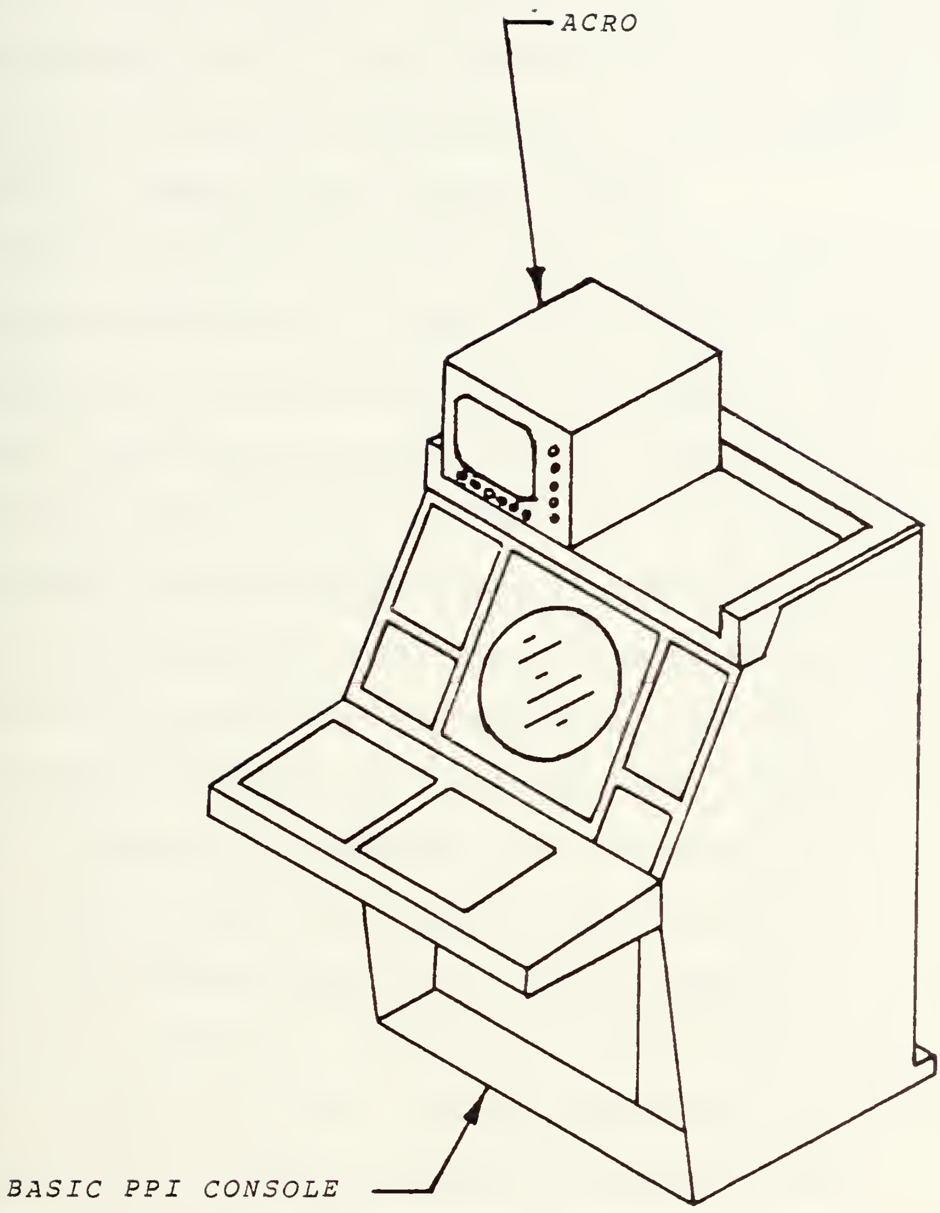

Figure 1: PPI Console with
Cathode-Ray Tube Readout

The operator must set priorities and shift demands in a dynamically changing operational environment. This phenomenon of time sharing of mental information processing has been defined as "the requirement (of a human operator) to divide his attention between two or more sources of information." (Gabriel and Burrows, 1968)

The oscillation of attention from one set of circumstances to another has long been an area of interest to researchers. It has been said, for example, that Julius Caesar could simultaneously dictate four letters while drafting a fifth (James, 1890). Research involving divided attention has been primarily utilized to study the amount of resource an operator must use in his performance and to simulate an operational environment. In effect, through research involving a time sharing task, a form of speed and load stress can be induced: load refers to the variety of stimuli to which the operator must attend, speed deals with the time available per stimulus (McCormick, 1976).

In sum, through a technique such as time sharing it is possible to extend the research model from those conditions expected in the ideal laboratory arena to include the additional variables associated with the operational system (Rolfe, 1969). It is with this criterion that the intermingling of search and short term memory tasks were utilized for the present experiment.

D. VISUAL SEARCH AND DETECTION

The eye is more suitable than any other sense organ for receiving most types of information needed by an operator (Baker and Grether, 1963). Differences in brightness, size, distance, color, location and movement of objects in a scene can be detected by the eye in equipment operation, but even these remarkable qualities are frequently not enough in a man-machine relationship. Measurements of extreme accuracy, speed of movement, historical comparison and resource quantity may be visual factors which the eye alone cannot provide to the operator. As a result, a display is provided which integrates the capabilities of the eye with the operation of the man-machine system (Grether and Baker, 1972).

How the information viewed on a display is translated to the operator is a complex task. In brief, the human eye moves in a series of discrete jumps or saccades from one portion of the scene to be viewed to another portion. These jumps may occur four or five times per second and move without further correction. That is, once the eye movement has begun it continues to its computed end point without correction adjustments. These jumps are then much like jumping from a chair: when put into motion the jumper continues in motion until reaching the floor regardless of corrective action taken while mid-air. The eye, in the search, is seeking meaningful information from the scene viewed and takes in information only during the fixation pause between

saccades. During the fixation the eyes code still pictures from the scene viewed and place these pictures in memory in the brain (Lindsay and Norman, 1972). The amount of information transmitted by the eye to the brain far exceeds that which is perceived, however (Welford, 1970).

The eye may wish to identify an object, such as an automobile or alpha-numeric character, and may not consider range, orientation or location; only those features which are important in identifying the object sought are critical. On the other hand, in locating an object in a scene the important considerations are position and orientation (Lindsay and Norman, 1972). Likewise, search time in locating a specific target in a field of view is partially related to the number of items visible in the field. Numerous studies have been conducted which indicate that search time is approximately proportional to the number of objects present in the display (Green, McGill, and Jenkins, 1953; Boynton, Elworth and Palmer, 1958; McGill, 1960, Baker, Morris and Steedman, 1960; Williams and Borow, 1962). It has been found however, that another factor contributing to search time is the number of objects similar to the target and not merely the number of objects in the scene (Williams, 1966).

In general, then, search time depends on the number and similarities of target and background. As a result, in a cluttered field, the number of missed targets tends to increase proportionally with an increase in clutter. If the

missing of targets is critical then one consideration for human engineering might be to filter our irrelevant targets (Baker and Grether, 1963).

E. MEMORY

According to Lindsay and Norman (1972) there are three distinct types of memory: a sensory information storage, short term memory and long term memory.

Sensory information storage is the system which maintains a short, accurate and complete picture of the world as it is received by the sensory system. An example is to close the eyes and then quickly glance at a scene and close the eyes again. The scene continues to be "seen" for a short while and then slowly dies away.

Short term memory retains not the complete image, but an immediate interpretation of events. For example, the words of a spoken sentence are recalled, not the sounds which make up the sentence. Anyone who has tried to repeat a sentence of a completely foreign language can attest to this condition. The capacity of short term memory is limited and the duration short. A telephone number read or heard can be retained in short term memory, but soon lost unless repeated over and over.

Long term memory is the most complex and deals with events long past. For example, to respond to the question, "Where were you last Saturday night?" requires reaching into long term memory.

In human engineering it is critical that information presented to an operator via displays enhances his enlightenment of the equipment operation through his use of sensory information storage, short term memory and long term memory. The use of flashing versus continuous warning lights, auditory versus visual warnings and written check lists versus memorized procedures are indications of but a few considerations in the use of the cognitive process during equipment operation.

Memory fades over time without a repetitive rehearsal of the information to be retained (Norman, 1969). Thus, the overtaxing of an operator in a continually changing operational environment may cause him to be unable to perform his tasks at a level demanded by the system designer or equipment engineer.

F. INTRODUCTION OVERVIEW

The present study represents an attempt to take into consideration the effects of visual search and detection, short term memory load and stress in simulating an operational environment for evaluation of a proposed auxiliary tactical data display for the U.S. Navy. The methodology of the experiment was designed to gather subject reaction time and correct responses under various degrees of display complexity and to investigate the effect on reaction time due to memory load demands. The primary purpose was to determine, from a fixed set of formatted displays, the amount of information

an operator can assimilate and to submit recommendations as to an optimal display format.

II. METHOD

A. SUBJECTS

Subjects for the experiment were 24 U.S. Navy enlisted men temporarily assigned to the transient quarters at Naval Training Center, San Diego, California. They were randomly selected for the experiment without regard to training, age or background except all were naive with respect to NTDS console operation. Each subject was tested for visual acuity through the use of a standard eye chart at a distance of twenty feet and was likewise queried as to his ability to sharply distinguish the characters on the cathode ray displays used during the research. In addition, each subject was questioned concerning his length of military service and military rate and rating. All performed the tasks voluntarily and were requested to not discuss the conduct of the experiment among other participants.

B. APPARATUS

Subjects were seated on a non-swivel desk chair in a noise reduced room in front of the experiment displays, a TEKTRONIX 4066-1 and VTO-5, at a distance which they determined to be most comfortable; generally 16 inches. The typewriter keyboard of the TEKTRONIX cathode ray display was approximately twenty-six inches above the floor for ease of inputs required during the experiment. Also, the display

screen of the TEKTRONIX was approximately twenty five degrees below the horizontal sight line for ease of reading. Directly above this lower display was placed a VTO-5 cathode ray unit; the screen of which was approximately five degrees above the horizontal line of sight. The two oscilliscope displays were positioned in this fashion, the VTO-5 resting on the TEKTRONIX 4006-1, in order to simulate the porposed NTDS auxiliary display (ACRO) on the radar scope console (Figure 2). All subject responses were entered through the TEKTRONIX keyboard to a digital lab PDP-12 computer manufactured by Digital Equipment Corporation. The computer was programmed to provide the display variation and sequencing of the two displays and was likewise utilized for timing subject responses and the gathering of other pertinent data relevant to the experiment.

C. TASK

Each trial during the experiment was initiated by a ready signal, "READY?" appearing in the center of the lower scope for 500 msec. This signal was then followed by a two or four letter non-repetitive consonant set which remained illuminated on the screen for two seconds. The set was made up of the following characters:

B,C,D,F,G,H,J,K,L,M,N,P,Q,R,S,T,W,X,Z.

After two seconds lapsed, one of the six formatted displays shown here as appendix A through F appeared in the upper screen and, simultaneously, a probe signal was presented

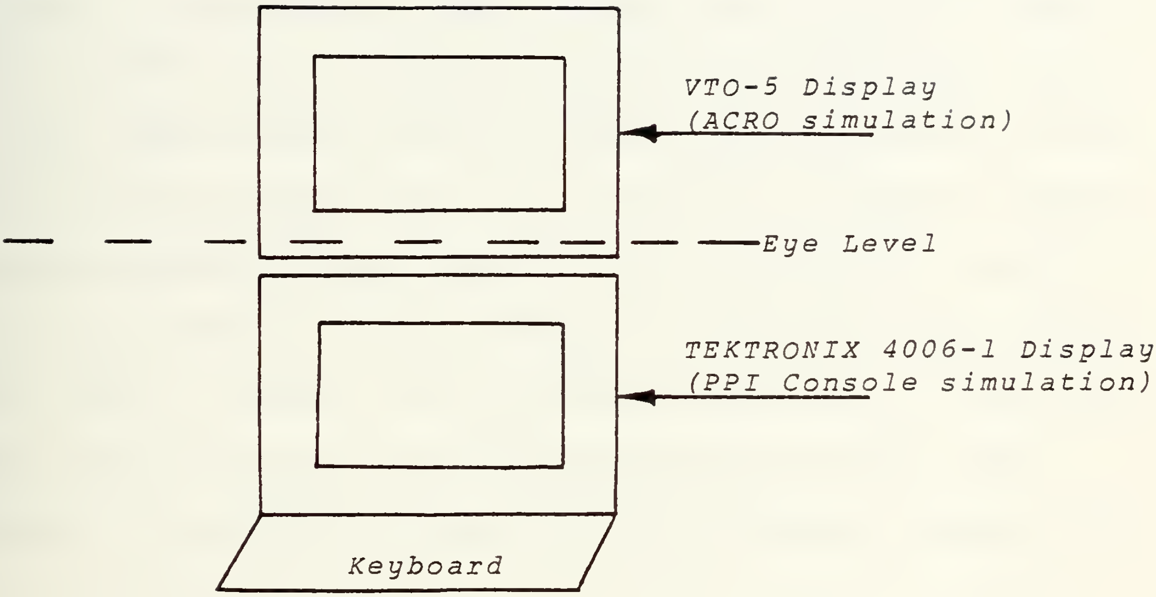

Figure 2: Oscilliscope Display Simulation

on the lower screen.[1] This probe signal was a duplication of one of the labels appearing in the upper screen, but without the three digit sequence assigned to the label. The operator's task was to search the upper screen for the label which matched the probe signal and to respond, on the keyboard, by entering the three number value associated with that label. If he correctly entered the three digit value within eight seconds he was automatically sequenced to the next portion of the trial. If, however, the eight seconds lapsed without correct entry or if he incorrectly entered the label data he did not progress to the next portion of the trial. Instead, he received an incorrect for the trial and a new trial was initiated beginning with the ready signal. Following a correct label data entry, though, and at fifteen seconds following the ready signal, a single letter would appear on the lower scope. The subject then had five seconds to respond indicating whether or not the probe letter was a member of the memory set shown at the beginning of the trial. Each trial consumed a total of twenty seconds. Figure 3 is included as an aid for understanding the task sequencing.

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1. Appendix A is in error in that all display letters were of the same size: a 5 by 7 dot matrix with each character approximately .08" wide and .12" high. Also, the numerical value for each label was made up of three digits and not four as shown in Appendix A.

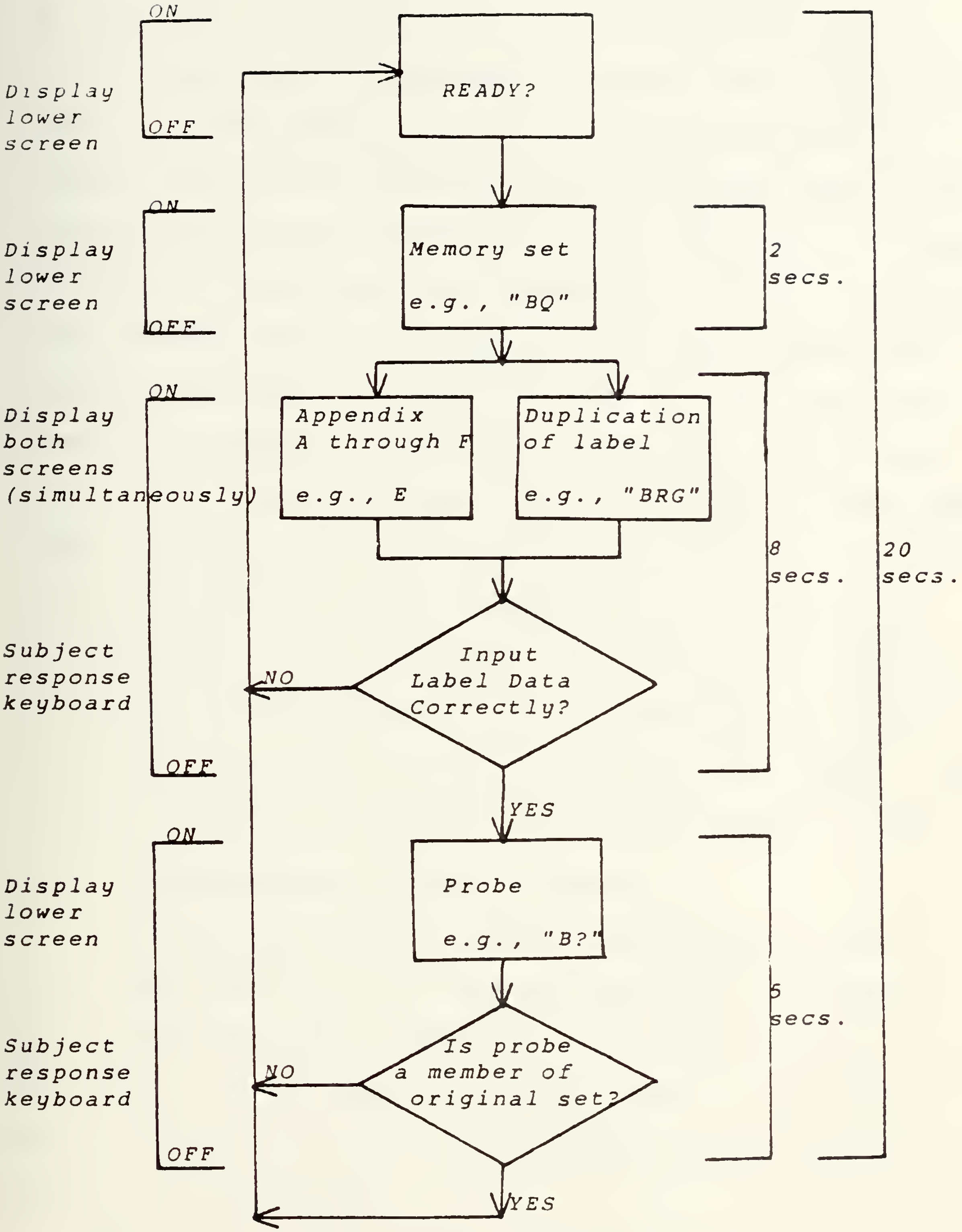

Figure 3: Trial Sequencing Flow Chart

D. DESIGN

The experiment was designed to compare six display formats for search time and accuracy. The six formats were chosen from a set of nineteen provided by Fleet Combat Direction Systems Activity (FCDSS) San Diego. Two of the formats represented formatting styles suggested by FCDSSA San Diego, two by FCDSSA Dam Neck, Virginia and two representing the current Direct Readout Display of NTDS consoles insofar as amount of information displayed is concerned. Each format was comprised of NTDS acronym labels, for example, BRNG, GMT, THRT, etc; the number of labels ranging from a low of six on ACRO #1 to a high of forty on ACRO #6. During each trial the three digit value associated with each label was made up of randomly assigned numbers with no leading zeros and with each label during each trial having a new set of values. The relative position of a label to the format display was the same throughout each of the six displays.

In conjunction with the search and accuracy task the memory task was utilized to simulate ongoing requirements that an operator would encounter during NTDS employment. That is, the memory task was used as a tool to indirectly examine disruptive effects on the format display task in an operational environment.

Specifically, each subject was given twenty-six practice trials prior to undergoing the experiment. During these trials he observed the procedure, performed practice trials and was free to ask questions. Subjects were told to keep

their hands near the keyboard, to type in their inputs to the search task in a manner which they found to be most comfortable and to strike the "1" key (left hand) for a "no" input concerning the memory probe and the "0" key (right hand) for a "yes" response. At the conclusion of the practice trials a brief rest was taken during which time the subject could ask questions and prepare for the research trials.

Every subject then underwent 120 continuous trials. Each of the six formats appeared in random order during each block of six trials. The result was that each format was displayed 20 times during a session. The probe for the search task was likewise randomly determined from the labels appearing in the display. Throughout the 120 trials each subject received an equal number of two or four letter stimuli for the memory task. Subjects were individually tested either during a morning session or in the afternoon; during normal working hours in all cases. The total time for each session, including visual acuity test, practice runs and actual experiment was approximately one hour.

III. RESULTS

A. SEARCH TASK RESPONSES

During that portion of the experiment involving the search of the formatted displays and label data inputs the subjects averaged 99.33 correct responses out of a possible 120. The scores ranged from a low of 61 to a high of 113. Likewise, the response time, for which a maximum of eight seconds was allotted, averaged 4.976 seconds and ranged from individual average of 4.284 to a high of 5.570.

The relationship between the number of labels in each display (ranging from six in ACRO 1 to forty in ACRO 6) and the total number of correct responses, across all subjects, is shown in Figure 4. The estimated linear relationship of correct responses to ACRO size is expressed by $Y = -3.97(X) + 484.72$ with the calculated correlation between the two variables being -.97. As the number of labels in the displays increased the total number of correct responses decreased.

On the other hand, the relationship between reaction time in locating and correctly inputting the label data to the number of labels in each display is positively correlated at .95. In this case, the estimated linear equation representing Figure 5 is $Y = .034(X) + 4.29$. As the number of display labels increased the reaction time increased.

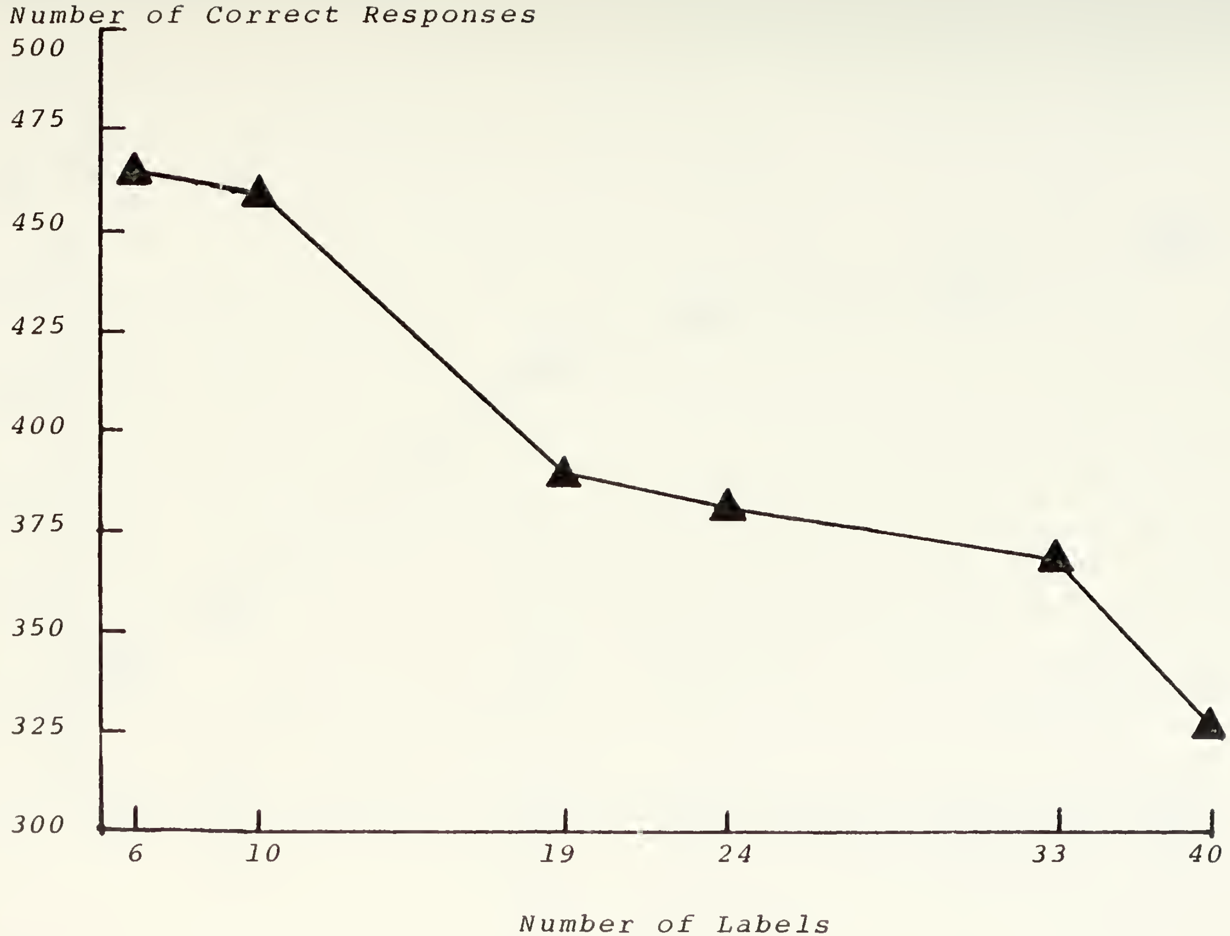

Figure 4: Number of Correct Responses versus Number of Labels in ACRO Display

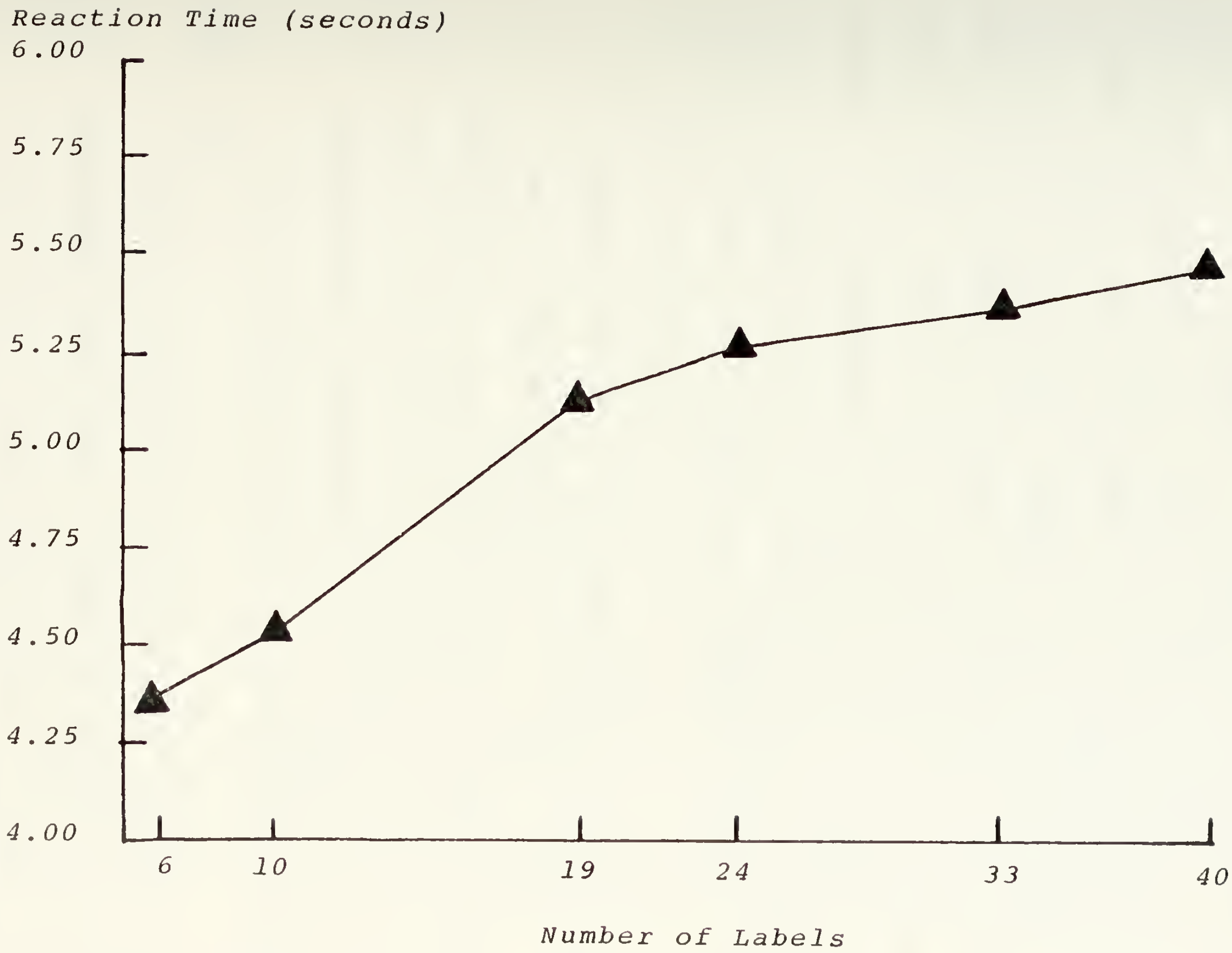

Figure 5: Mean Reaction Time versus Number of Labels in ACRO Display

B. ANALYSIS OF INCORRECT RESPONSES

Next, subject error in responding to the visual display search task was of two types: (a) error of commission which resulted in the subject's incorrectly inputting the label data entry within the allotted eight seconds (e.g., task is to find "BRG" which requires the associated data entry of 123 and subject incorrectly inputs 124) and (b) lapse errors which were caused by subject's failure to locate the appropriate label and/or input a three digit set within eight seconds. As indicated by Figure 6, the percent of lapse errors increased with an increase in display complexity while percent of errors of commission remained fairly constant without regard to ACRO size.

The correlation of lapse error to ACRO size was positive at .97 and is represented by $Y = .72(X) - 3.21$. This trend is in keeping with the finding that increased reaction times are closely associated with increased display size and likewise reemphasizes the necessity to filter out irrelevant targets in those situations where the missing of targets is important.

The relative stability of errors of commission is expressed by a calculated positive correlation coefficient of .62 and the estimated linear relationship of $Y = .10(X) + 2.33$. This trend could be associated with influential factors other than display size. For example, an inappropriately designed keyboard for data entry, stress while undergoing the experiment or incorrect perception of the data label may have been

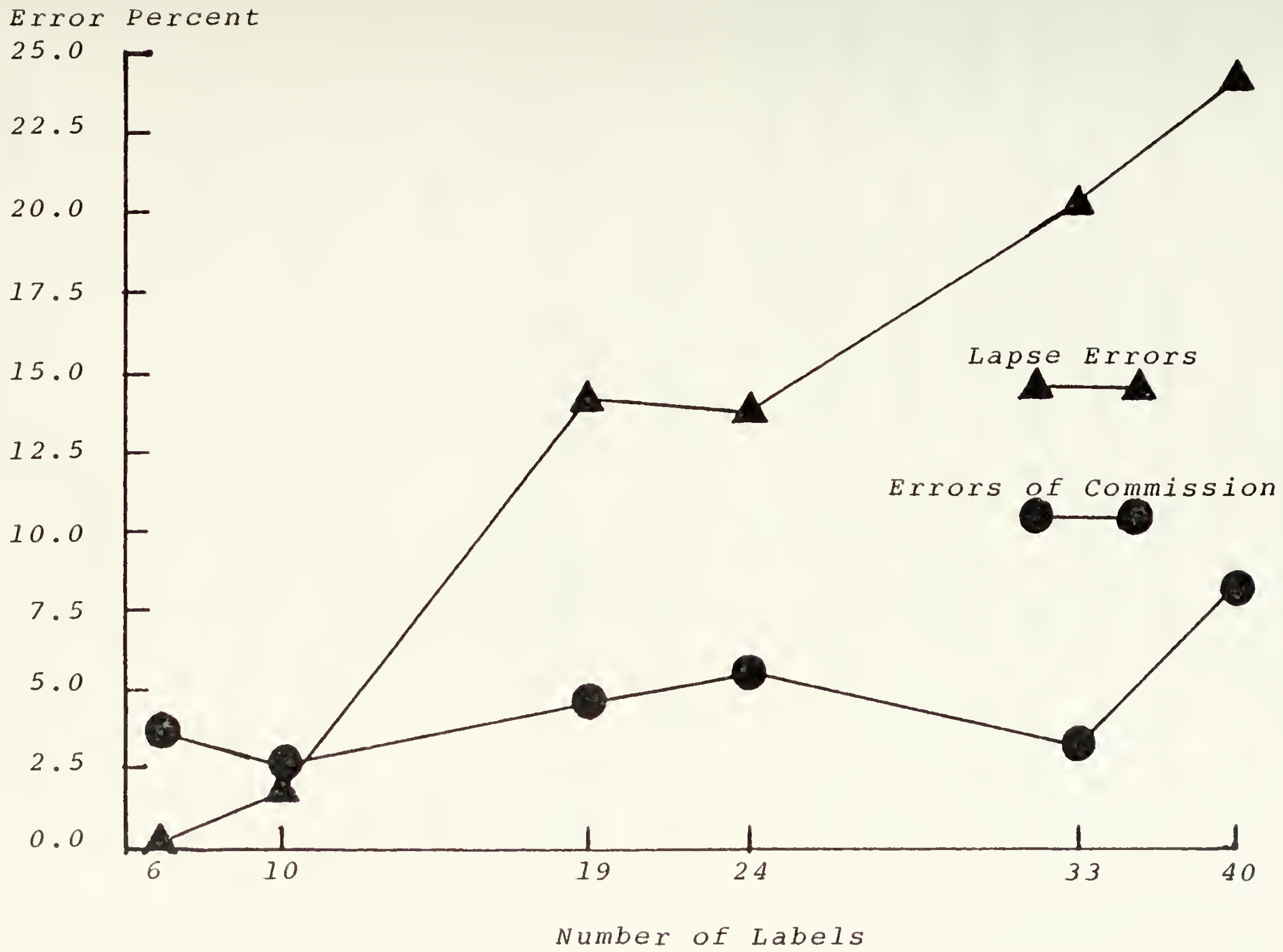

Figure 6 : Percent Errors versus Number of Labels in ACRO Display

contributing factors to the commission errors observed. These topics are, however, beyond the scope of this study.

C. TESTS OF STATISTICAL SIGNIFICANCE

An analysis of variance (Edwards, 1968) was performed to test the null hypothesis that mean reaction time did not differ significantly with regard to the number of labels in each ACRO display. Table I, a two way analysis of variance (ANOVA), rejects the null hypothesis and indicates there is a significant difference, (P<.001) in mean reaction time with regard to the number of labels through which the subject must search.

Two Way Analysis of Variance Table

Source	Degrees Freedom	Sum of Squares	Mean Square	F ratio
ACRO	5	28.7544	5.7509	64.7983*
Subjects	23	24.3169	1.0573	11.9127*
Error	115	10.2063	.0888	
Total	143	63.2776		

*P<.001

Table I

Duncan's Multiple range test (Edwards, 1968), Table II, was used to determine which of the ACRO mean reaction times differed. The underscored means do not differ significantly at a probability less than .001. That is, for example, ACRO 1 and ACRO 3 do not differ; ACRO 2, ACRO 5, ACRO 4,

ACRO 6 do not differ significantly. These results are also in keeping with findings that the larger display size results in greater inaccuracy and delayed response time.

Duncan's Multiple Range Test

ACRO number (number of labels)

	ACRO 1(6)	ACRO 3(10)	ACRO 2(19)	ACRO 5(24)	ACRO 4(33)	ACRO 6(40)	Test R
Mean	4.360	4.550	5.120	5.261	5.391	5.478	
4.360		.190	.760	.901	1.031	1.118	R2 .4752
4.550			.570	.711	.841	.928	R3 .4899
5.120				.141	.271	.358	R4 .5000
5.261					.130	.217	R5 .5078
5.391						.087	R6 .5140

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Table II

Finally, a three way ANOVA (Edwards, 1968) was conducted, Table III, to determine the significance of the memory task on mean reaction time for the display search requirement. The null hypothesis that no significant difference exists on visual search mean reaction time due to the memory task load could not be rejected at .001 probability level.

Three Way Analysis of Variance Table

Source	Degrees Freedom	Sum of Squares	Mean Square	F ratio
Memory	1	.8477	.8477	4.8098
ACRO	5	57.5898	11.5180	65.3556*
Subjects	23	48.1211	2.0922	11.8717*
Error	258	45.4688	.1762	
Total	287	152.0273		

*P<.001

Table III

D. RESULTS OVERVIEW

Therefore, factors which affect correct responses to the visual display search task are the number of similar labels through which the operator must search. In addition, reaction time for correct responses is delayed as the complexity of the display increases.

It must be emphasized that the data points for each ANOVA were based solely on correct responses which could differ for each subject. This possible inhomogeneity of variance is not considered crucial in these findings, however, due to the extremely large ratios computed for the significance test. That is, including correct responses per ACRO per subject reduces the sum of squares for error and has the overall affect of increasing the ratio for the significance

tests. This increase merely strengthens rejection of the null hypothesis.

IV. DISCUSSION

It is not unexpected that reaction time increased and response accuracy decreased as a function of display complexity. These findings are supported by Egeth, Atkinson, Gilmore and Marcus (1973). In general, as an operator must scan a display for vital information he can more readily and correctly identify his target in an uncluttered field of view. Particularly in this present study where each label was, for the most part, similar in length and orientation, the subject had to sight each label and locate his target. Thus, simply stated, the time required in reading a lengthy list of similar items is greater than that of reading a condensed list. Also, in reading a lengthy list the likelihood for error is increased either by failure to locate the target or hurriedly and mistakenly identifying a false target.

Likewise, the failure of the memory task to be statistically significant (at a probability level less than .001) on the formatted display mean reaction times is supported by Wattenbarger and Pachella (1972). Their findings concluded that a memory load of less than 6 items had no effect on the primary task. In the present study the consonant set of 2 or 4 letter memory stimuli did not interfere significantly with correct visual search reaction time.

Finally, though visual search time and accuracy of responses tested statistically significant, this study can make

no assessment as to the practicality of this difference. That is, the mean reaction times for display formats differed by approximately 1.1 seconds. The practical importance of this reaction time difference, in comparison to possible computer software limitations in a NTDS operational evolution, is a question for consideration in implementing the ACRO formatted display system.

V. RECOMMENDATIONS

In general, the key to designing an appropriate format from those examined in this study is to incorporate the dimensions of reaction time versus correct responses. Obviously the display with the least amount of detail provides greatest accuracy and substantially diminished reaction time latencies. However, in an operational system the time requirement in a correct interpretation of display information may not be as critical as in this study. As well, the problems involved in numerous simple formats versus complex arrangments might complicate NTDS computer programming beyond acceptable limits. The compromise necessary to optimize all variables must be dealt with in order to provide the NTDS system with the additional tool possible through the ACRO display. Other avenues are available for consideration in future experimentation.

An area of interest in a continuing study would be an experiment in which the subject pages or sequences from a general, all inclusive, display to a series of less complex formats. For example, the operator is requested to provide weapon information from the general format relative to a specific target, (e.g., a strike aircraft). He then requests the less complex strike aircraft format and from this display further requests an additional display specific to weapon information. From the present study it has been shown

that the least complex displays provide the greatest accuracy. Utilizing the above recommendation it may be that the trade off between the possibility of increased reaction time could be off set by an increased response accuracy.

Also, utilizing the basic scenario of the present study, it would be of interest to analyze reaction times and accuracy of responses when the format target label flashes at an appropriate rate. It is highly suspected that the two variables of reaction time and accuracy would change radically.

The incorporation of experienced versus inexperienced operators could as well provide insight into recommended display formats. In this regard, the secondary task should be complicated to include a larger memory set or eliminated completely. Experienced NTDS operators, because of selection and training, could possibly assimilate more information and demonstrate greater oscillation of attention with no degradation in performance. The present study opens many avenues for continued investigation.

AIR FRND STRK/SUPP ASW
TN 1292
PIF 1729

CUS 1585
SPD 1217
ALT 1463

ACRO #1 DRO CLOSE CONTROL

ENGAGE

AIR FRND INT/FGTR CAP
TN 392
PIF 977

MK76	685	MK54	829	LB11A	317	MK84	563	FUEL	498
MK44	244	FFAR	314	SU44A	822	MK58	164		
MK46	201	HVAR	885	NAS	942				
MK57	246	MK52	578	NPS	406				

ACRO #2 DRO WPN INV ASW A/C

AIR UNK

TN	977	CUS	685	GMT	392
PIF	829	SPD	317		
BRG	563	ALT	498		
RNG	244	SIZ	314		

ACRO #3 SAN DIEGO CLOSE CONTROL AIR UNK

ENGAGE

AIR FRND INT/FGTR CAP

								GMT	392		
TN	977			CUS	685			ACQ	829		
PIF	317			SPD	563			LST	498		
BRG	244			ALT	314			STQ	822	RR	164
RNG	201	THRT	885	SIZ	942			LTQ	246	CU	578
MK76	406	MK54	676	LB11A	724	MK84	839	FUEL	214		
MK44	542	FFAR	895	SU44A	287	MK58	755				
MK46	702	HVAR	625	NAS	276						
MK57	301	MK52	460	NPS	488						

ACRO #4 SAN DIEGO WPN INV ASW A\C

SURF FRND LINE CV

								GMT	392		
TN	977	RRR	685	CUS	829	M1	317	ACQ	563		
PIF	498	LAT	244	SPD	314	M2	822	LST	164		
BRG	201	LONG	885	ALT	942	M3	246	STQ	578	RR	406
RNG	676	THRT	724	SIZ	839	M4	214	LTQ	542	CU	895

ACRO #5 DAM NECK CLOSE CONT

ENGAGE

AIR FRND STRK/SUPP ASW

								GMT	392		
TN	977	RRR	685	CUS	829	M1	317	ACQ	563		
PIF	498	LAT	244	SPD	314	M2	822	LST	164		
BRG	201	LONG	885	ALT	942	M3	246	STQ	578	RR	406
RNG	676	THRT	724	SIZ	839	M4	214	LTQ	542	CU	895
MK76	287	MK54	755	LB11A	702	MK84	625	FUEL	276		
MK44	301	FFAR	460	SU44A	408	MK58	103				
MK46	539	HVAR	460	NAS	571						
MK57	548	MK52	578	NPS	341						

ACRO #6 DAM NECK WPN INV, ASW A/C

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